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EUROPEAN ATOMIC ENERGY COMMUNITY - EURATOM

Nuclear Installations in the Countries of the European Atomic Energy Community

(Second Edition)

1 January 1963

Directorate-General for Industry and Economy

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European Atomic Energy Community - EURATOM
Directorate-General for Industry and Economy
Brussels, 1 January 1963 - 43 pages

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INTRODUCTORY NOTE

1. The following survey, drawn up on 1 January 1963, is designed to provide those circles interested in the development of nuclear industry with an overall picture of the installations which already exist or which are planned within the Community.

2. For the sake of brevity and uniformity, only the main characteristics of the installations listed are featured. For the same reason, it is not possible to include all the enterprises involved in various ways in the building of the installations mentioned. Data on capacities or performances are intended merely as a rough guide and are subject to any modifications which may be required by changes in market conditions, technology and research. Projects offering a reasonable certainty of being implemented have been included wherever they would seem to foreshadow possible lines of development in certain sectors.

3. This document has been drawn up on the basis of information published by the various enterprises and bodies within the Community; it still may contain certain omissions, of which we should be glad to receive notice from the parties concerned.

4. A number of enterprises were kind enough to bring to the notice of the Commission their comments and additional information prompted by the first edition. These new data are included in the present edition. The Commission would like to extend its thanks to the enterprises concerned for their assistance in repairing omissions and bringing the document up to date.

5. A third edition will be published once the picture given in the present inventory has been substantially modified by the emergence of new installations or the elaboration of new plans.

ABBREVIATIONS

The following conventional abbreviations have been employed :

1. Status of projects referred to ("STATUS" column) :

T	— Built
C	— Being built
D	— Construction decided on
P	— Seriously envisaged construction project

2. Euratom and non-Euratom countries referred to ("COUNTRY" column) :

BE	— Belgium
GF	— West Germany
FR	— France
IT	— Italy
NL	— Netherlands
UK	— Great Britain
US	— United States of America

3. Enterprises or organizations frequently mentioned :

BMAt	— Bundesministerium für Atomenergie und Wasserwirtschaft (Germany)
C.E.A.	— Commissariat à l'Energie Atomique (France)
C.E.N.	— Centre d'Etudes de l'Energie Nucléaire (Belgium)
C.N.E.N.	— Comitato Nazionale Energia Nucleare (Italy)
E.D.F.	— Electricité de France
R.C.N.	— Reactor Centrum Nederland (Netherlands)
U.K.A.E.A.	— United Kingdom Atomic Energy Authority (Great Britain)

NOMENCLATURE OF NUCLEAR REACTORS

The expressions used in the present document to describe the different types of nuclear reactors have the following meaning :

INDUSTRIAL REACTORS : are built and operated for the purpose of producing energy (mainly in the form of electricity) and/or fissile materials (in particular plutonium). They are used only exceptionally for study purposes, but are central to intensive development programs in which the construction and operating industries necessarily play an extremely important role.

PROTOTYPE REACTORS : their conception, design and dimensions are such that their construction and operation enable the transition to be made quite safety to the industrial reactor of the same type.

REACTOR EXPERIMENTS : are intended for preliminary technical tests, or are remote variants of already-proven reactor types.

TEST REACTORS : (general or specialised) are used mainly for subjecting materials to irradiation tests.

EXPERIMENTAL REACTORS : extremely varied in type and power, are used essentially as neutron sources for various research purposes.

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BIBLIOGRAPHY OF MAIN SOURCES OF INFORMATION USED IN THE COMPILATION OF THE INVENTORY

— Annales des Mines (Monthly review - France)

— Atomkernreaktoren (Pamphlet issued by BMAt - Germany)

— Atom und Wasser- Informationen (Press Bulletin of BMAt - Germany)

— Atomenergie en haar toepassingen (Monthly review - R.C.N. /Netherlands)

— Bulletins d'Informations scientifiques et techniques du C.E.A. (Monthly review - France)

— Bulletins d'information de l'Association belge pour le développement pacifique de l'énergie atomique (Two monthly review - Belgium)

— Annual company reports from firms in the member-countries

— Directory of Nuclear Reactors (Vols. I and II, Vienna Agency)

— Energia nucleare (Monthly review of the C.I.S.E. - Italy)

— Il programma Nucleare italiano dopo la seconda conferenza di Ginevra (Prof. F. Ippolito)

— Industries Atomiques (Two-monthly review - Switzerland)

— Kernforschung und Atomwirtschaft in Deutschland (Information pamphlet - Germany)

— Rapporto 1960-61 (Comitato Nazionale Energia Nucleare - Italy)

— Rapports annuels 1957-1958-1959-1960-1961 du Commissariat à l'Energie Atomique (C.E.A. - France)

— Reactor Centrum Nederland - Verslag over het jaar 1961 (1961 Annual Report)

— Taschenbuch für Atomfragen 1960 /61 (BMAt - Germany)

SECTION I — Uranium and Thorium Mines

SITE of installation and address of managing body	CHARACTERISTICS	ENTERPRISES concerned	COUNTRY	STATUS
ELLWEILER Kreis Birkenfeld (Rhine-Palatinate) Gewerkschaft Carolus II Uetze /Hann. Buschhof	— Extraction capacity : 50-300 t /day ore — Reserves : 60-80 t uranium — Ore content 0.1 to 0.12 % uranium	Site owner : Land of Rhine-Palatinate Operator : Gewerkschaft Carolus II	GF	T
CEA mining outfits : LA CROUZILLE VENDEE FOREZ GRURY Commissariat à l'Energie Atomique, DREM 69, rue de Varenne Paris 7e	Ore production in 1961 : La Crouzille : 282,000 t Vendée : 306,000 t Forez : 140,000 t Grury : — 728,000 t Total reserves in tons of contained U : Estimated ore available / Total potential La Crouzille 3,492 / 6,594 Vendée 1,790 / 2,686 Forez-Grury 3,961 / 5,870	Owner-operator : Commissariat à l'Energie atomique	FR	T
Privately-owned mining operations : Works :	Supplied to CEA in 1961 : 300,000 t of ore Owner and operator : SCUMRA			
SAINT-PIERRE (Cantal) SOURCES DE LA VIENNE ESCOUSSAC Société Centrale de l'Uranium et des Minerais et Métaux radioactifs (SCUMRA) 1, rue F. Bastian Paris 8e	In 1959, production equivalent to 96 t U metal		FR FR FR	T T T
Works : INGUINIEL (Morbihan) PRAT-MERIEN (Morbihan) BONOTE-EN-BERNE (Morbihan) Société Industrielle et Minière de l'Uranium (SIMURA) 31, avenue de l'Opéra Paris 8e	Owner and operator : SIMURA		FR FR FR	T T T

SECTION I — Uranium and Thorium Mines

SITE of installation and address of managing body	CHARACTERISTICS	ENTERPRISES concerned	COUNTRY	STATUS
Works :		Owner and operator : R.E.S.S.		
LE DRIOT (Haute-Loire) *	26 t of U metal produced up to 31.12.59		FR	T
LIGONZAG *			FR	T
Société pour la Recherche et l'Exploitation du Sous - Sol (R.E.S.S.) 70, avenue Edison Paris 13e				
Works :		Owner and operator : Saint-Gobain		
EGLETONS (Corrèze)			FR	T
LA BARRIERE			FR	T
VEDRENNE-SUD			FR	T
Saint-Gobain Company 62, boulevard Victor Hugo Neuilly-sur-Seine				
Works :		Owner and operator : Société SEREMIC		
ESPEYRAC (Aveyron) *			FR	T
Société SEREMIC 27-29, rue St-Ferdinand Paris 17e				
Works :		Owner and operator : CFMU		
SAINT - JEAN LA FOUILLOUSE (Lozère)			FR	T
LES PIERRES PLANTEES (Lozère)	25 t contained Uranium produced up to 31 December 1959 in the course of prospecting		FR	T
LE MONTAGAUD (Creuse)			FR	T
LOMBARTEIX (Creuse) *			FR	T
LA BREJADE (Corrèze)			FR	T
MARGABAL (Aveyron) *			FR	T
CHAUDES - AIGUES (Cantal) *			FR	T
BASSENEUILLE (Creuse) *			FR	T
LE CELLIER (Lozère)	Production of 190 t of U metal up to end of 1959 (Open-cast mining)		FR	T
Compagnie Française des Minerais d'Uranium 10, Place Vendôme Paris 1er				

* Information received while this document was being printed indicates that operation of these mines has been stopped

SECTION II — Ore Concentrating Plants

SITE of installation and address of managing body	CHARACTERISTICS	ENTERPRISES concerned	COUNTRY	STATUS
ELLWEILER Kreis Birkenfeld/Nahe (Rhine-Palatinate) (Experimental Plant) Gewerkschaft Brunhilde Uetze-Hann. Buschhof	Production capacity : 20-22 t/year uranium oxide, in process of extension	Site owner and plant operator : Gewerkschaft Brunhilde	GF	T
GUEUGNON (near the Grury - S. et L. mines) (Production of pure uranyl nitrate) Commissariat à l'Energie Atomique 69, rue de Varenne Paris 7e	Processing capacity : 30,000 t/year Average ore content : 0,6 % Factory adapted in 1961 for the processing of preconcentrates from Mounana (Gabon)	Owner and operator : CEA	FR	T
L'ECARPIERE (Gétigne, L.A.) (Near the Mines d'Ecarpière et de la Chapelle-Largeau) Société Industrielle des Minerais de l'Ouest (SIMO) 11, rue de la Baume Paris 8e	Processing capacity : 300,000 t/year Average ore content : 0.1 % Ores processed in 1961 : 316,000 t	Owner and operator : Société Industrielle des Minerais de l'Ouest (SIMO)	FR	T
BESSINES (near the Mines de la Crouzille et Margnac, H.V.) Production of magnesium uranate Société Industrielle des Minerais de l'Ouest (SIMO) 11, rue de la Baume Paris 8e	Processing capacity : 600,000 t/year Average ore content : 0.125 % Ores processed in 1961 : 376,000 t	Owner and operator : Société Industrielle des Minerais de l'Ouest (SIMO)	FR	T
BOIS-NOIRS (near the Mines de St-Priest-La Pugne, Forez) Production of sodium uranate Société Industrielle des Minerais de l'Ouest (SIMO) 11, rue de la Baume Paris 8e	Construction completed in 1960 Processing capacity : 180,000 t/year Average ore content : 0.185 % Ores processed in 1961 : 147,000 t	Owner : C.E.A Operator : Société Industrielle des Minerais de l'Ouest (SIMO)	FR	T
SAN DONATO MILANESE Pilot plant for processing uranium-bearing ores Società Minerali Radioattivi Energia Nucleare (SOMIREN) San Donato Milanese Milan	Processing capacity : 10 t/day Production 65 % U_3O_8	Owner and operator : Società Minerali Radioattivi Energia Nucleare (SOMIREN)	IT	T

SECTION III — Plants for the Chemical Processing and Refining of Concentrates

SITE of installation and address of managing body	CHARACTERISTICS	ENTERPRISES concerned	COUNTRY	STATUS
OLEN (Refining plant) Société Générale Métallurgique de Hoboken 14, rue Adolf Greiner Hoboken-lez-Anvers	Production capacity : 750 t /year UO_3	Owner and operator : Société Générale Métallurgique de Hoboken	BE	T
WOLFGANG (Semi-industrial installation) Nukem-Wolfgang bei Hanau	Production capacity : 50 t /year of uranium in the form of metal, oxide or carbide and 5-10 t of thorium oxide and metal	Owner and operator : NUKEM (Nuklear-Chemie und Metallurgie GmbH)	GF	T
LE BOUCHET Processing and refining of thorium and uranium concentrates Commissariat à l'Energie Atomique 69, rue de Varenne Paris 7e	Production capacity : 500 t /year contained uranium Able to produce 250-300 t /year of contained thorium in the form of crystallized nitrate 1961 production : Natural U metal : 310 t Concentrates (Sodium uranate) 59 t U_3O_8 118 t Semi-finished products : 27 t Thorium nitrate : 203 t	Owner and operator : CEA	FR	T
MALVESI (near Narbonne, Aude) Société de Raffinage d'Uranium (SRU) 23, boulevard Georges Clémenceau Courbevoie (Seine)	Production capacity : uranium metal : 1,000 t /year natural and depleted U 1961 production : Natural U metal : 651 t Depleted U metal : 51 t Pure depleted UO_3 : 205 t	Owner : CEA Operator : SRU (Société de Raffinage d'Uranium) constituted by the CEA, PEC and St. Gobain-Nucléaire Industrial architect : SETU (Sté d'Etudes et de Travaux pour Uranium) comprising : — Société Potasse et Engrais Chimiques (PEC) — Société Saint-Gobain	FR	T

SECTION IV — Plants for the Preparation of all types of Nuclear Fuel

SITE of installation and address of managing body	CHARACTERISTICS	ENTERPRISES concerned	COUNTRY	STATUS
OLEN (pilot plant for the production of uranium metal) Société Générale Métallurgique de Hoboken 14, rue Adolf Greiner Hoboken-lez-Anvers	Production capacity : 50 t/year uranium metal	Owner and operator : Société Générale Métallurgique de Hoboken	BE	T
WOLFGANG Nukem Wolfgang bei Hanau	UO_2 sintering and compression installation with capacity of 20 t/year Smelting and shaping installation for uranium metal with capacity of 50 t/year Thorium smelting and sintering installation with capacity of 5 to 10 t/year	Owner and operator : Nukem (Nuklear-Chemie und Metallurgie GmbH)	GF	T
LE BOUCHET Metal ingot production Commissariat à l'Energie atomique 69, rue de Varenne Paris 7e	Production capacity : 500 t/year uranium metal	Owner and operator : CEA	FR	T
LA ROCHELLE - LA PALLICE Fabrication of thorium metal and thorium compounds Compagnie „Péchiney-Groupe Terres rares" 67, rue de Prony Paris 17e	Processing capacity : 1,000 t/year monazite Thorium nitrate production : 75 t/year Production capacity : — nuclear-grade thorium oxide: 30 t/year — thorium metal billets : 25 t/year	Owner and operator : Société Péchiney	FR	T
ORSAY (Domaine de Corbeville) Production of sintered UO_2 pellets Compagnie industrielle des Combustibles atomiques frittés (CICAF) 63, rue de Beaumarchais Montreuil-sous-Bois (Seine)	Production capacity : 25 t/year	Owner and operator : Compagnie industrielle des Combustibles atomiques frittés (CICAF) Constructor : Compagnie générale de Télégraphie sans Fil (CSF)	FR	T
SALUGGIA Plant for production of natural and enriched uranium fuels ITALATOM s.p.a. 39, via Montebello Milan	Planned production capacity : 270 t/year uranium metal 50 t/year uranium oxide	Owner and operator : „Italatom", formed by Sorin, Engelhardt Industries of Canada, Anglo-American and Mallincrodt Nuclear Co (USA)	IT	C

SECTION V — Fuel Element Fabrication Plants

SITE of installation and address of managing body	CHARACTERISTICS	ENTERPRISES concerned	COUNTRY	STATUS
DESSEL Shaping and cladding of fuels Métallurgie et Mécanique Nucléaires S.A. (MMN) 25, rue des Colonies Brussels	Initial capacity : 200 t/year cladded fuels	Owner and operator : MMN (a subsidiary of FN and SGMH)	BE	T
WOLFGANG Nukem Wolfgang (Hanau/Main)	Production capacity : 20 t/year	Owner and operator : Nukem (Nuklear-Chemie und Metallurgie GmbH)	GF	T
BONNEUIL-sur-Marne Compagnie pour l'Etude et la Réalisation de Combustibles Atomiques S.A. (CERCA) 16, route de Stains Bonneuil-sur-Marne	Production capacity : 4 sets of fuel elements for EL 3 per year (for example)	Owner and operator : Compagnie pour l'Etude et la Réalisation des Combustibles Atomiques (CERCA)	FR	T
ROMANS-sur-Isère (Drôme) Fabrication of fuel elements for power reactors Compagnie pour l'Etude et la Réalisation de Combustibles Atomiques S.A. (CERCA) 16, route de Stains Bonneuil-sur-Marne	It is planned that the installation will supply the CEA reactors at Marcoule and the EDF reactors with natural uranium-based fuels	Owner and operator : CERCA	FR	T
ANNECY (Savoie) Société industrielle de Combustibles Nucléaires (SICN) 98, avenue du Petit Brogny Annecy (Savoie)	Production capacity : 750 t/year uranium metal	Owners : SACM, UGINE, Tréfileries et Laminoirs du Havre, Compagnie Française des Métaux Operator : SICN (Société Industrielle des Combustibles Nucléaires) Constructors : SACM (Société Alsacienne de Constructions Mécaniques)	FR	T
TURIN Fiat, s.p.a. Corso G. Marconi, 10 Turin	Laboratory and plant for fuel element fabrication	Future owner and operator : FIAT	IT	P

SECTION VI — Uranium Hexafluoride Plants

SITE of installation and address of managing body	CHARACTERISTICS	ENTERPRISES concerned	COUNTRY	STATUS
PIERRE-BENITE Experimental plant for the production and distillation of uranium hexafluoride Ugine Service des produits fluorés 16, rue Monceau Paris 8e	Development of industrial scale manufacture of uranium hexafluoride with a view to isotope separation	Owner and operator : UGINE	FR	T
PIERRELATTE (Drôme) Société des Usines chimiques de Pierrelatte 10, rue du Général Foy Paris 8e	Fabrication of uranium hexafluoride with a view to isotope separation	Owner and operator : Société des Usines chimiques de Pierrelatte	FR	C

SECTION VII — Uranium Enrichment Plants

SITE of installation and address of managing body	CHARACTERISTICS	ENTERPRISES concerned	COUNTRY	STATUS
PIERRELATTE (Drôme) (Isotope separation plant) Commissariat à l'Energie Atomique 69, rue de Varenne Paris 7e		Owner : CEA Firm commissioned for research work : Société de Recherches Techniques et Industrielles Responsible contractor : USSI (Company for the construction of an isotope separation plant) Le Plessis-Robinson (Seine) Constructors : — Boilers : Cégédur, Fives-Penhoët, Soudure autogène, Bignier-Schmid, Chausson — Piping : Entrepose, Audincourt, La Ciotat, Alsacienne (SACM), Heurtey — Electricity : Thomson-Houston, Alsthom, CGE, Marlin-Gérin, SW, Rateau — Compressors : Hispano - Suiza — Screens : CSF, Ugine, Carbone-Lorraine, Metzfram, Comptoir Lyon-Alemand, SFEC — Chemistry : Saint-Gobain, Société des Usines chimiques de Pierrelatte — Civil Engineering : Entreprise Dumez, Ets. A. Besson Lepeu — Installation of safety devices : Electro-Entreprise	FR	C

SECTION VIII — Plants for the Reprocessing of Irradiated Fuels

SITE of installation and address of managing body	CHARACTERISTICS	ENTERPRISES concerned	COUNTRY	STATUS
MARCOULE Plutonium extraction and separation plant Commissariat à l'Energie Atomique 69, rue de Varenne Paris 7e	In operation since 6 July 1958	Owner and operator : CEA Industrial architect : Saint - Gobain Nucléaire	FR	T
MOL EUROCHEMIC : cf. Annex A : international installations with which Euratom or the member countries are associated			OE CE	C
CAP DE LA HAGUE (Calvados) Plutonium chemical extraction plant Commissariat à l'Energie Atomique 69, rue de Varenne Paris 7e	The plant will concentrate on the reprocessing of irradiated fuels from Chinon (EDF 1, 2 and 3) and Brennilis (EL 4) Construction work started in 1961 Probable duration of construction work : 3 years	Owner and operator : CEA Industrial Architect : Saint-Gobain Nucléaire	FR	C
ROTONDELLA (Prov. of Matera) PCUT Pilot plant for the chemical processing of irradied U-Tho fuels Comitato Nazionale Energia Nucleare Via Belisario, 15 Rome	Chemical processing of uranium oxide and thorium oxide-based fuels irradiated in the Elk River reactor (USA) and refabrication of fuel elements (Programme cycle uranium-thorium PCUT)	Owner and operator : CNEN Constructors : CNEN and Bombrini Parodi Delfino (contract signed on 15 November 1961)	IT	C
SALUGGIA (Prov. of Vercelli) EUREX (Enriched URanium EXtraction) Reprocessing plant for MTR-type highly-enriched uranium fuels Comitato Nazionale Energia Nucleare Via Belisario, 15 Rome	The design provides for a capacity of 15 kg per day of U-Al which could be stepped up to 31 kg per day Initial trials scheduled for 1964	Owner and operator : CNEN Constructors : 1. Overall design : Vitro Engineering Co. in conjunction with CNEN technicians 2. Detailed design : CNEN in conjunction with Vitro Italiana (contract signed on 15 November 1961)	IT	P

SECTION IX — Plants for the Manufacture of Moderator Materials

SITE of installation and address of managing body	CHARACTERISTICS	ENTERPRISES concerned	COUNTRY	STATUS
HEAVY WATER				
TOULOUSE Pilot plant for heavy water production Compagnie française de l'eau lourde c/o ONIA Toulouse (Haute-Garonne)	Heavy water production by fractional distillation of hydrogen obtained from synthetic mixture Capacity : 1.5 to 2 t/year *N.B.* The plant was shut down in April 1961 after a sufficient stock of deuterium and protonium had been constituted	Studies : Liquid air General contractor : Office national Industriel de l'Azote Owner and operator : Compagnie française de l'eau lourde	FR	T
HOECHST (Griesheim) Pilot plant for heavy water production Farbwerke Hoechst/Hoechst	Heavy water production by fractional distillation of pure hydrogen Capacity : 6 t/year	Owner and operator : Farbwerke Hoechst	GF	T
GRAPHITE				
KROPFMÜHL Graphitwerke Kropfmühl AG Max-Joseph Strasse, 2 Munich	Work on the development of nuclear grade graphite from natural graphite	Owner and operator : Graphitwerke Kropfmühl	GF	T
BAD-GODESBERG/ MEHLEM Ringsdorff-Werke GmbH Bad-Godesberg-Mehlem	Shaping and hardening natural nuclear grade graphite	Owner : Kropfmühl - Ringsdorff Arbeitsgemeinschaft für Sondergraphite Operator : Ringsdorff-Werke GmbH	GF	T
MEITINGEN Plant for the production and shaping of nuclear graphite from electrolytic graphite Sigri-Kohlefabrikate GmbH Meitingen ü. Augsburg	Production capacity : 200 t/year	Owner and operator : Farbwerke Hoechst AG and Siemens-Planiawerke AG für Kohlefabrikate	GF	T
CHEDDE Péchiney - Compagnie de Produits Chimiques et Electrométallurgiques 23, rue Balzac Paris 8e	Production capacity : 6,000 t/year	Owner and operator : Péchiney	FR	T

SECTION IX — Plants for the Manufacture of Moderator Materials

SITE of installation and address of managing body	CHARACTERISTICS	ENTERPRISES concerned	COUNTRY	STATUS
NOTRE DAME DE BRIANÇON (Savoie) Cie. Industrielle Savoie-Acheson 10, rue du Général Foy Paris 8e	Production capacity : 1,800 t /year Machining and shaping to order	Owner and operator : Cie. Industrielle Savoie-Acheson	FR	T
VAL CAMONICA (Prov. Brescia) Elettrografite di Forno Allione S.p.A. 28, Via Durini Milano	Production capacity : 2,000 t /year	Owner and operator : Elettrografite di Forno Allione S.p.A.	IT	T
MARCOULE Commissariat à l'Energie Atomique 69, rue de Varenne Paris 7e	Graphite-shaping workshop	Owner and operator : CEA	FR	T
BERYLLIUM				
SALINDRES (Beryllium oxide preparation)	Production capacity : 36 t /year (contained metal)	In collaboration with Ugine, Péchiney is studying the problems of beryllium oxide behaviour under irradiation resistance to corrosion in water under pressure, and in liquid sodium	FR	T
LA PRAZ (Fabrication of beryllium oxide bricks)	Production capacity : 10 t /year		FR	T
CALYPSO (Saint - Jean - de - Maurienne) (Beryllium metal fabrication) Péchiney - Compagnie de Produits Chimiques et Electrométallurgiques 23, rue Balzac Paris 8e	Production capacity : 15 t /year		FR	T

SECTION X — Zirconium Plants

SITE of installation and address of managing body	CHARACTERISTICS	ENTERPRISES concerned	COUNTRY	STATUS
CUISE-LAMOTHE (Oise) Plant for zirconium hafnium separation and zirconium oxide fabrication Société Nobel-Bozel 67, Boulevard Haussmann Paris 8e	1961 production : 100 t of hafnium-free nuclear-grade zirconium oxide. Hafnium oxide production capacity from 1962 : 200 kg per month	Owner : CEA State-appointed operator : Nobel-Bozel	FR	T
JARRIE (Isère) Chlorination of zircone and production of zirconium sponges Electro-Chimie UGINE 10, rue du Général Foy Paris 8e	Production of hafnium-free zirconium sponges	Owner and operator : Ugine	FR	T
UGINE (Savoie) Fabrication of zirconium ingots and semifinished products Electro-Chimie UGINE 10, rue du Général Foy Paris 8e	Ingots, billets and sheet bars of zirconium	Owner and operator : Ugine	FR	T
VENTHON (Savoie) Electro-Chimie UGINE 10, rue du Général Foy Paris 8e	Zirconium fabrication and alloy tests	Owner and operator : Ugine	FR	T
GUEUGNON (Saône-et-Loire) Hot and cold rolling plant Forges de GUEUGNON 1, rue Paul Baudry Paris 8e	Zirconium sheets	Owner and operator : Les Forges de Gueugnon in conjunction with Ugine	FR	T
PERSAN (Seine-et-Oise) Fabrication of zirconium tubes and angular sections Cie. du Filage des Métaux et des Joints 30, Avenue de Messine Paris 8e	Production capacity : 10 to 50 t /month	Owner and operator : Céfilac in association with Vallourec	FR	T

SECTION X — Zirconium Plants

SITE of installation and address of managing body	CHARACTERISTICS	ENTERPRISES concerned	COUNTRY	STATUS
MONTBARD (Côte d'Or) Fabrication of zirconium tubes and angular sections VALLOUREC 6, rue Daru Paris 8e The agent for the sale of these products is : CEFILAC 30, avenue de Messine Paris 8e	Production capacity : 10 to 50 t/year	Owner and operator : Vallourec in association with Céfilac	FR	T
HANAU Production of zirconium sponge and half finished products in nuclear grade zirconium Production of zircaloy alloys WC Heraeus GmbH Postfach 369 Hanau (16)		Owner and operator : WC Heraeus	GF	T
CONSTANCE Pilot-plant for production of hafnium - free zirconium tetrachloride Deutsche Gold und Silber-Scheideanstalt (Degussa) 9, Weissfrauenstrasse Frankfurt/Main		Owner and operator : Degussa	GF	T
WOLFGANG (near Hanau/Main) Production of zirconium sponges, ingots, bars) Nukem, Wolfgang bei Hanau	An electronic smelting furnace is in operation	Owner and operator : Nukem (Nuklear-Chemie und Metallurgie GmbH)	GF	T

SECTION XI A — Research, Training and Materials' Testing Reactors, etc.

REACTOR Site, description, use and address of managing body	CHARACTERISTICS	ENTERPRISES concerned	COUNTRY	STATUS
MOL BR 1 Research reactor CEN - Centre d'Etude de l'Energie Nucléaire 31, rue Belliard Brussels	— Typ : natural uranium, graphite moderator, air-cooled — Power : 4-10 MW(th) — Fuel : natural uranium — Load : 23 to 25 t — Max. thermal neutron flux : 2.1×10^{12} n /cm² sec — Criticality : 11 May 1956	— Owner : Centre d'Etude de l'Energie Nucléaire (CEN) — Operator or user : CEN — Constructor(s) : CEN — Main Suppliers : Belgian industry	BE	T
MOL BR 2 Materials' testing reactor CEN - Centre d'Etude de l'Energie Nucléaire 31, rue Belliard Brussels	— Type : uranium-beryllium, light water — Power : 50 MW(th) — Fuel : 90 % enriched uranium — Load : 4 to 5 kg U 235 — Max. thermal neutron flux : 6.2×10^{14} n /cm² sec — Max. fast neutron flux : 2.1×10^{15} n /cm² sec — Criticality : 1 July 1961	— Owner : CEN — Operator or user : CEN /EURATOM Association — Constructor(s) : CEN in collaboration with BEN, Belgonucléaire, Nuclear Development Corp. of America — Main suppliers : ACEC - MBLE, SAC, La Meuse, Cockerill-Ougrée, Metals and Controls Brush Beryllium Sylcor	BE	T
MOL BR 02 Critical assembly Centre d'Etude de l'Energie Nucléaire (CEN) 31, rue Belliard Brussels	— Type : swimming-pool test reactor for BR 2 — Power : 50 kW(th) — Fuel : 90 % enriched U — Load : 1.5 to 2 kg U 235 — Max. thermal neutron flux in the order of : 10^{11} n /cm² sec — Criticality : 14.1.60	— Owner : CEN — Operator or user : CEN /EURATOM Association — Constructor(s) : cf. BR 2 — Main suppliers : cf. BR 2	BE	T
MOL VENUS Physics study of Vulcain reactor Centre d'Etude de l'Energie Nucléaire (CEN) 31, rue Belliard Brussels	— Type : enriched UO_2, H_2O+ D_2O mixed in varying proportions — Power : very low — Fuel : enriched UO_2 — Load : — Max. thermal neutron flux : — Criticality : mid-1963	— Owner : — Operator or user : — Constructors : — Main suppliers :	BE	D
GHENT R.B. - B.N. 1 Experimental reactor Institut interuniversitaire des Sciences Nucléaires 11, rue d'Egmont Brussels	— Type : swimming pool, graphite moderator — Power : 15 kW(th) — Fuel : 6 % enriched U — Load : —Max. thermal neutron flux. : 1.5×10^{11} n /cm² sec — Criticality : planned for 1963	— Owner : Institut interuniversitaire des Sciences Nucléaires — Operator or user : Ghent University — Constructor(s) : Belgonucléaire — Main Suppliers :	BE	C

REACTOR Site, description, use and address of managing body	CHARACTERISTICS	ENTERPRISES concerned	COUNTRY	STATUS
JÜLICH FRJ 1 (MERLIN) Experimental reactor Kernforschungsanlage Jülich des Landes Nordrhein-Westfalen e.V. (KFA) Cecilienstrasse, 41 Düsseldorf	— Type : swimming-pool, enriched U, light water — Power : 2 to 5 MW(th) — Fuels : 80 % enriched U — Load : 4,5 kg U 235 — Max. thermal neutron flux : 5×10^{13} n/cm² sec — Criticality : 23 February 1962	— Owner : Land Nordrhein-Westfalen — Operator or user : Universities of Bonn, Cologne and Aachen — Constructor(s) : AEG and Ruhrstahl AG — Main suppliers : Nuclear Energy Co (GB), AEI John Thompson	GF	T
JULICH FRJ 2 MPR DIDO Materials testing reactor Kernforschungsanlage Jülich des Landes Nordrhein-Westfalen e.V. (KFA) Cecilienstrasse, 41 Düsseldorf	— Type : Dido, enriched U, heavy water cooled and moderated — Power : 10 MW(th) — Fuel : 90 % enriched U — Load : 2.5 kg U 235 — Max. thermal neutron flux : 10^{14} n/cm² sec — Criticality : 15 November 1962	— Owner : Land Nordrhein-Westfalen — Operator or user : Universities of Bonn, Cologne and Aachen — Constructor(s) : AEG and Ruhrstahl AG — Main suppliers : Head Wrightson Processes Ltd (G.B.)	GF	T
BERLIN-WANNSEE BER Experimental reactor Hahn - Meitner Institut für Kernforschung Berlin Forschungsreaktor Berlin Glienickerstrasse Berlin-Wannsee	— Type : homogeneous — Power : 50 kW(th) — Fuel : 20 % enriched U ($UO_2 SO_4$ solution) — Load : 1.4 kg U 235 — Max. thermal neutron flux : 10^{12} n/cm² sec — Criticality : 24 July 1958	— Owner : Land of Berlin — Operator or user : Hahn-Meitner Institut für Kernforschung Berlin — Constructor(s) : Arbeitsgemeinschaft AEG, Pintsch-Bamag und SSW — Main suppliers : North American Aviation (Atomics International)	GF	T
BRAUNSCHWEIG PTB Measurement reactor Experimental reactor Physikalisch-Technische Bundesanstalt Braunschweig	— Type : swimming pool - enriched U, moderated and cooled with light water — Power : 1.000 kW — Fuel : 90 % enriched U — Load : 3.2 kg U 235 — Max. thermal neutron flux : 6×10^{12} n/cm² sec — Criticality :	— Owner : Physikalisch - Technische Bundesanstalt Braunschweig — Operator : Physikalisch Technische Bundesanstalt — Constructor : Babcock & Wilcox — Main suppliers :	GF	P
FRANKFURT FRF Experimental reactor Institut für Kernphysik der Universität Frankfurt Am Römerhof, 31 Frankfurt/Main	— Type : homogeneous — Power : 50 à 100 kW(th) — Fuel : 20 % enriched U ($UO_2 SO_4$ solution) — Load : 1.4 kg U 235 — Max. thermal neutron flux : 10^{12} n/cm² sec — Criticality : 10 January 1958	— Owner : Land Hessen — Operator or user : Frankfurt University — Constructor(s) : AEG, BBC, SSW, Mannesmann — Main suppliers : North American Aviation (Atomics International)	GF	T

REACTOR Site, description, use and address of managing body	CHARACTERISTICS	ENTERPRISES concerned	COUNTRY	STATUS
GROSSWELZHEIM AEG PR 10 Testing reactor Allgemeine Elektricitäts-Gesellschaft (AEG) AEG Hochhaus Frankfurt/Main-Süd-10	— Type : Argonaut, light water moderated and cooled, graphite reflector — Power : 10 Watt — Fuel : 20 % enriched U (U_3O_8) — Load : 2 to 5.7 kg U 235 — Max. thermal neutron flux : — Criticality : 27 January 1961	— Owner : AEG — Operator or user : AEG — Constructor(s) : AEG — Main suppliers : AEG Fuel elements : Nukem, Wolfgang Reflector graphite : Siemens-Plania-Griesheim	GF	T
HAMBURG-GEESTHACHT FRG Experimental reactor Gesellschaft für Kernenergieverwertung in Schiffbau und Schiffahrt mbH Normannenweg, 10 Hamburg 26	— Type : swimming-pool, enriched U — Power : 5 MW(th) — Fuel : 90 % enriched U (second core) — Load : 6.4 kg U 235 — Max. thermal neutron flux : 3.2×10^{13} n/cm² sec — Criticality : 23 October 1958	— Owner : Gesellschaft für Kernenergieverwertung in Schiffbau und Schiffahrt (GKSS) — Operator or user : GKSS — Constructor(s) : German Babcock and Wilcox, American Babcock and Wilcox — Main suppliers : Babcock & Wilcox Co., USA Fuel elements : NUKEM	GF	T
MAINZ FRMZ Experimental reactor Inorganic Chemistry Institute Mainz-University Mainz	— Type : Triga Mark II, pulsed reactor, zirconium hydride moderator — Power : 30 KW(th) — Fuel : 20 % enriched U — Load : 2.2 kg U 235 — Max. thermal neutron flux : about 10^{15} n/cm² sec in pulsed operation — Criticality : scheduled for 1963	— Owner : Mainz University — Operator or user : Inorganic Chemistry Institute Mainz University — Constructor(s) : General Atomics — Main suppliers : Gutehoffnungshütte Sterkrade AG	GF	C
MUNICH-GARCHING SUR 100 (Siemens Training Reactor) Experimental reactor SSW Reaktorstation Garching *N.B.* This reactor will later be supplied to the Technical University, Berlin-Charlottenburg	— Type : graphite reflector, polyethylene reactor — Power : 0.1 W — Fuel : 20% -enriched U_3O_8 — Load : 4.4 kg U_3O_8 — Max. thermal neutron flux : — Criticality : 28 February 1962	— Owner : SSW — Operator : SSW — Main Suppliers : SSW — Fuel elements : NUKEM	GF	T

REACTOR Site, description, use and address of managing body	CHARACTERISTICS	ENTERPRISES concerned	COUNTRY	STATUS
MUNICH-GARCHING FRM Experimental reactor Laboratorium für Technische Physik der TH München Arcisstrasse, 21 Munich 2	— Type : swimming-pool, light water cooled and moderated — Power : 1 MW(th) — Fuel : 20 % enriched U — Load : 4.869 kg U 235 — Max. thermal neutron flux : 1.9×10^{13} n/cm² sec — Criticality : 31 October 1957	— Owner : Land Bavaria — Operator or user : Technische Hochschule, Munich, and Munich University — Constructor(s) : — Main suppliers : American Machine and Foundry Co (AMF)	GF	T
MUNICH-GARCHING SAR (Siemens Argonaut Reaktor) Experimental reactor Siemens-Schuckertwerke AG Werner von Siemensstrasse, 50 Erlangen	— Type : Argonaut, heterogeneous, enriched U, graphite, light water — Power : 1 to 10 kW(th) — Fuel : 20 % enriched U — Load : 2 to 5.7 kg U 235 — Max. thermal neutron flux : 10^{11} n/cm² sec (at 10 kW(th) — Criticality : 23 June 1959	— Owner : Siemens-Schuckertwerke AG (SSW) — Operator or user : SSW and Munich University — Constructor : SSW — Main suppliers : SSW	GF	T
KARLSRUHE FR 2 Testing reactor Kernreaktor Bau-u.-Betriebsgesellschaft mbH (K I) Weberstrasse, 5 Karlsruhe	— Type : natural uranium, heavy water cooled and moderated — Power : 12 MW(th) — Fuel : natural U — Load : 5 t natural U and 1 t thorium — Max. thermal neutron flux : 3.5×10^{13} n/cm² sec — Criticality : 12 November 1962	— Owner : Kernreaktor-Bau u. Betriebsgesellschaft mbH (KI) Weberstrasse, 5, Karlsruhe — Operator or user : as above — Constructor(s) : Installation : Dinglerwerke AG — Main suppliers : Heat exchangers : Maschinenfabrik Augsburg (MAN) and German Babcock-Wilcox Containment : Dinglerwerke AG and Krupp Steel vessel and thermal shield : Gutehoffnungshütte Oberhausen Biological shielding : Dinglerwerke AG Circuit pumps D20 : Klein-Schanzlin u. Becker Fuel elements : NUKEM Control and safety rods : Siemens	GF	T
KARLSRUHE (Siemens Argonaut Reaktor) Experimental Reactor Gesellschaft für Kernforschung mbH (K II) Friedrichsplatz, 4 Karlsruhe	— Type : Argonaut, heterogeneous enriched uranium, graphite, light water — Power : 10 W — Fuel : 20 % enriched U_3O_8 aluminium caning — Load : — Max. thermal neutron flux : — Criticality : scheduled for 1963	— Owner : Gesellschaft für Kernforschung mbH (K II) Friedrichsplatz, 4, Karlsruhe — Operator or user : — Constructor(s) : Arbeitsgemeinschaft Siemens-Schuckertwerke AG Erlangen-Berlin, Lurgi GmbH, Frankfurt, Pintsch Bamag AG, Butzbach — Main suppliers : Fuel elements : NUKEM	GF	C

SECTION XI A — Research, Training and Materials' Testing Reactors, etc.

REACTOR Site, description, use and address of managing body	CHARACTERISTICS	ENTERPRISES concerned	COUNTRY	STATUS
KARLSRUHE Subcritical assembly Reactor physics study Kernreaktor Bau-u. Betriebsgesellschaft mbH Weberstrasse, 5 Karlsruhe	— Type : natural uranium, heavy water moderated — Power : 0 — Fuel : natural U — Max. thermal neutron flux : 10^4 n /cm² sec — Criticality :	— Owner : Kernreaktor-Bau u. Betriebsgesellschaft mbH (K I) — Operator : as above — Constructor(s) : — Main suppliers : Fuel elements : Nukem	GF	T
FONTENAY-AUX-ROSES MINERVE Testing reactor CEN de Fontenay-aux-Roses Boîte postale n° 6 Fontenay-aux-Roses (Seine)	— Type : swimming-pool, enriched U, light water moderated and cooled — Power : 100 W — Fuel : 20 % enriched U — Load : critical mass of 3 to 5 kg U 235 — Max. thermal neutron flux : 10^{11} n /cm² sec — Criticality : 29 September 1959	— Owner : CEA — Operator or user : CEN Fontenay-aux-Roses — Constructor(s) : Industrial architect : Indatom — Main suppliers : Seratom	FR	T
FONTENAY-AUX-ROSES TRITON Experimental reactor CEN de Fontenay-aux-Roses Boîte postale n° 6 Fontenay-aux-Roses (Seine)	— Type : swimming pool, enriched U, light water - moderated and -cooled, BeO reflector — Power : 2000 kW(th) — Fuel : 20 % enriched U — Load : 3 kg U 235 — Max. thermal neutron flux : 10^{13} n /cm² sec — Criticality : 30 June 1959	— Owner : CEA Operator or user : CEN Fontenay-aux-Roses — Constructor(s) : Indatom — Main suppliers : French industry	FR	T
FONTENAY-AUX-ROSES ELI - ZOE Experimental reactor Centre d'Etudes Nucléaires de Fontenay-aux-Roses Boîte postale n° 6 Fontenay-aux-Roses (Seine)	— Type : natural U, heavy water cooled and moderated — Power : 150 kW(th) Fuel : natural U — Load : 1,940 kg natural U — Max. thermal neutron flux : 10^{12} n /cm² sec — Criticality : 15 December 1948	— Owner : CEA — Operator or user : CEN Fontenay-aux-Roses — Constructor(s) : CEA — Main suppliers : French industry	FR	T
SACLAY EL 2 Experimental reactor Centre d'Etudes Nulcéaires de Saclay Boîte postale n° 2 Gif-sur-Yvette (Seine-et-Oise)	— Type : natural U, heavy water moderated Coolant : CO_2 — Power : 2,500 kW(th) — Fuel : natural U — Load : 2.950 kg natural U — Max. thermal neutron flux : 10^{13} n /cm² sec — Criticality : 21 October 1952	— Owner : CEA — Operator or usser : CEN Saclay — Constructor(s) : CEA — Main suppliers : French industry	FR	T

SECTION XI A — Research, Training and Materials' Testing Reactors, etc.

REACTOR Site, description, use and address of managing body	CHARACTERISTICS	ENTERPRISES concerned	COUNTRY	STATUS
SACLAY EL 3 Testing reactor Centre d'Etudes Nucléaires de Saclay Boîte postale n° 2 Gif-sur-Yvette (Seine-et-Oise)	— Type : enriched U, heavy water moderated and cooled — Power : 17 MW(th) — Fuel : 1.35 % to 1.60 % enriched U — Load : 673 kg — Max. thermal neutron flux : 10^{14} n/cm² sec — Criticality : 4 July 1957	— Owner : CEA — Operator or user : CEN Saclay — Constructor(s) : Chantiers de l'Atlantique et France Atome — Main suppliers : French industry	FR	T
SACLAY Rubéole Critical assembly Centre d'Etudes Nucléaires de Saclay Boîte postale n° 2 Gif-sur-Yvette (Seine-et-Oise)	— Type : enriched U, beryllium oxide moderated and cooled — Power : 0 — Fuel : 35 % enriched U in molybdenum alloy — Load : — Maximum thermal neutron flux : 10^{8} n/cm² sec — Criticality : 3 July 1959	— Owner : CEA — Operator or user : CEN Saclay — Constructor(s) : CEA — Main suppliers : French industry	FR	T
SACLAY Peg Mobile demonstration pile Centre d'Etudes Nucléaires de Saclay Boîte postale n° 2 Gif-sur-Yvette (Seine-et-Oise)	— Type : swimming pool, enriched U — Power : 0.1 W — Fuel : 20 % enriched U — Load : 3.2 kg U 235 — Max. thermal neutron flux : 3×10^{6} n/cm² sec — Criticality : 1959	— Owner : CEA — Operator or user : CEA — Constructor(s) : Chantiers de l'Atlantique — Main suppliers :	FR	T
SACLAY Aquilon Experimental reactor Centre d'Etudes Nucléaires de Saclay Boîte postale n° 2 Gif-sur-Yvette (Seine-et-Oise)	— Type : natural U, heavy water moderated, graphite reflector — Power : 100 Watt — Fuel : natural U — Load : — Max. thermal neutron flux : 10^{7} n/cm² sec — Criticality : 11 August 1956	— Owner : CEA — Operator or user : CEN Saclay — Constructor(s) : CEA — Main suppliers : French industry (Electrical equipment : Electro-Entreprise)	FR	T
SACLAY Alize Experimental reactor Centre d'Etudes Nucléaires de Saclay Boîte postale n° 2 Gif-sur-Yvette (Seine-et-Oise)	— Type : enriched U, light water moderated — Power : very low — Tuel : 1.5 % enriched U — Load : about 2,000 kg enriched U — Max. thermal neutron flux : 5×10^{7} n/cm² sec — Criticality : 18 June 1959	— Owner : CEA — Operator or user : CEN Saclay — Constructor(s) : Caratom — Main suppliers : Caratom	FR	T

SECTION XI A — Research, Training and Materials' Testing Reactors, etc.

REACTOR Site, description, use and address of managing body	CHARACTERISTICS	ENTERPRISES concerned	COUNTRY	STATUS
SACLAY Proserpine Experimental reactor Centre d'Etudes Nucléaires de Saclay Boîte postale n° 2 Gif-sur-Yvette (Seine-et-Oise)	— Type : homogeneous, plutonium sulphate, beryllium oxide and graphite — Power : 1 Watt — Fuel : plutonium — Load : critical mass : 260 gr — Max. thermal neutron flux : 7×10^7 n /cm² sec — Criticality : 17 March 1958	— Owner : CEA — Operator or user : CEN Saclay — Constructor(s) : CEA — Main suppliers : French industry	FR	T
SACLAY Alecto Experimental reactor Centre d'Etudes Nucléaires de Saclay Boîte postale n° 2 Gif-sur-Yvette (Seine-et-Oise)	— Type : Pu in solution, light-water-moderated — Power : 0 — Fuel : plutonium — Load : — Max. thermal neutron flux : — Criticality : 8 November 1961	— Owner : CEA — Operator or user : CEN, Saclay — Constructor : CEA — Main suppliers :	FR	T
SACLAY Ulysse Experimental reactor Institut National des Sciences et Techniques Nucléaires (INSTN) Boîte postale n° 6 Gif-sur-Yvette (Seine-et-Oise)	— Type : Argonaut, ligth water-cooled and moderated — Fuel : enriched U 90 % — Power : 100 kW — Load : — Max. thermal neutron flux : 1.4×10^{12} n /cm² sec — Criticality : 23 July 1961	— Owner : INSTN — Operator : INSTN — Constructor : Anxiatome — Main suppliers : (Electrical equipment, controls, cabling : Electro-Entreprise)	FR	T
MARCOULE Marius Critical assembly Materials' and fuel elements' testing Centre de Production de Plutonium de Marcoule Chusclan (Gard)	— Type : natural U, graphite — Power : 100 Watt — Fuel : natural U G.2 fuel elements — Load : variable — Max. thermal neutron flux : 10^9 n /cm² sec — Criticality : 8 January 1960	— Owner : Electricité de France — Operator or user : Centre de Marcoule in collaboration with EDF — Constructor(s) : EDF - CEA — Main suppliers : French industry	FR	T
CADARACHE Pégase Testing reactor Commissariat à l'Energie Atomique 69, rue de Varenne Paris 7e	— Type : swimming - pool, light water cooled and moderated, BeO-Be reflector — Power : 20-30 MW(th) — Fuel : 20 % enriched U — Load : — Max. thermal neutron flux : 1.5×10^{14} n /cm² sec — Criticality : scheduled for 1963	— Owner : CEA — Operator or user : CEA — Constructor(s) : Group « Propeg » Design : Penhoët Chantiers de la Pallice — Main suppliers : French Industry (controls, cabling Electro-Enterprise)	FR	C

SECTION XI A — Research, Training and Materials' Testing Reactors, etc.

REACTOR Site, description, use and address of managing body	CHARACTERISTICS	ENTERPRISES concerned	COUNTRY	STATUS
CADARACHE Peggy Full-scale model of the nuclear part of the «Pégase» project Commissariat à l'Energie Atomique 69, rue de Varenne Paris 7e	— Type : swimming - pool, light water cooled and moderated, enriched U — Power : 1 kW(th) — Fuel : 20 % enriched U — Load : 7.5 kg of U 235 — Max. thermal neutron flux : 5×10^9 n /cm² sec — Criticality : 2 February 1961 (Saclay), 7 December 1961 (Cadarache)	— Owner : CEA — Operator or user : CEA — Constructor(s) : Design : CEA, Chantiers de l'Atlantique, Hispano-Suiza — Main suppliers :	FR	T
CADARACHE Rapsodie Reactor experiment Commissariat à l'Energie Atomique 69, rue de Varenne Paris 7e	— Type : Plutonium and enriched U, sodium - cooled fast neutron breeder reactor — Power : 10 MW(th) with possibility of extension until 20 MW(th) — Fuel : plutonium and enriched U — Load : — Max. thermal neutron flux : 10^{15} n /cm² sec — Criticality : scheduled for mid-1965 (beginning of work July 1961)	— Owner : CEA — Operator or user : CEA in conjunction with Euratom — Constructor(s) : Design : CEA, Chantiers de l'Atlantique, Hispano-Suiza Industrial Architect : Groupement Atomique Alsacienne - Atlantique (G 3A) — Main suppliers : French industry	FR	C
CADARACHE Cabri Test reactor Commissariat à l'Energie Atomique 69, rue de Varenne Paris 7e	— Type : swimming pool — Power : low — Fuel : enriched U — Load : — Max. thermal neutron flux : — Criticality : beginning of work July 1962 — Criticality scheduled for end of 1963	— Owner : CEA — Operator or user : CEA — Constructor(s) : Pile Study Department, CEA Pile construction Department, CEA, G 3A — Main suppliers :	FR	C
CADARACHE Azur Critical experiment Nuclear mockup of a land-based prototype reactor designed to serve as a drive unit for a nuclear submarine Commissariat à l'Energie Atomique 69, rue de Varenne Paris 7e	— Type : enriched U light-water-moderated — Power : low — Fuel : enriched U alloyed with zirconium — Load : — Max. thermal neutron flux : Criticality : 9 April 1962	— Owner : CEA — Operator or user : CEA — Constructor(s) : Nuclear propulsion group, CEA — Main suppliers : Civil engineering : Agence Coulon Mechanics and Hydraulics: Omnium Technique d'Etudes et de Réalisations (OTER) Controle : CF. Thomson-Houston Fuel elements : Tréfileries et Laminoirs du Havre Zirconium : Ugine	FR	T

SECTION XI A — Research, Training and Materials' Testing Reactors, etc.

REACTOR Site, description, use and address of managing body	CHARACTERISTICS	ENTERPRISES concerned	COUNTRY	STATUS
CADARACHE César Critical assembly Commissariat à l'Energie Atomique 69, rue de Varenne Paris 7e	— Type : natural or enriched U, graphite — Power : 100 Watt — Fuel : natural or enriched U — Load : — Max. thermal neutron flux : — Criticality : scheduled for 1964	— Owner : CEA — Operator or user : CEA and EdF — Constructor : CEA — Main suppliers : French Industry	FR	C
GRENOBLE Mélusine Experimental reactor Centre d'Etudes Nucléaires de Grenoble Grenoble (Isère)	— Type : swimming-pool, enriched U, light water cooled and moderated — Power : 2,000 kW(th) — Fuel : 20 % enriched U — Load : 4,094 kg U 235 — Max. thermal neutron flux : 10^{13} n /cm² sec — Criticality : 1 July 1958	— Owner : CEA — Operator or user : CENG — Constructor(s) : Indatom — Main suppliers : French industry	FR	T
GRENOBLE Siloé Experimental reactor Centre d'Etudes Nucléaires de Grenoble Grenoble (Isère)	— Type : swimming-pool, enriched U, light water, BeO-Be reflector — Power : 10 MW(th) — Fuel : 90 % enriched U — Load : 25 elements of 196 g say 4 kg 9 of U 235 — Max. thermal neutron flux : 8×10^{13} n /cm² sec — Criticality : scheduled for 1963 (work begins in 1961)	— Owner : CEA — Operator or user : CENG — Constructor(s) : Industrial Architect : Indatom — Main suppliers : Civil Engineering : Grands Travaux de Marseille	FR	C
ISPRA Ispra 1 Experimental reactor Centro di Studi Nucleari di Ispra	— Type : CP 5 Enriched U, heavy water cooled and moderated — Power : 5 MW(th) — Fuel : 20 % enriched U — Load : 14 kg U — Max. thermal neutron flux : 8×10^{13} n /cm² sec — Criticality : 24 March 1959	— Owner : CNEN — Operator or user : CNEN — Constructor(s) : — Main suppliers : American Car and Foundry (ACF Industries)	IT	T
ISPRA Ispra 2 Experimental reactor Centro di Studi Nucleari di Ispra	— Type : swimming pool, light-water-moderated and cooled — Power : 10 kW rated max. 100 kW(th) — Fuel : 20 % enriched U — Load : 3800 to 4200 gr U 235 — Max. thermal neutron flux : 2×10^{11} n /cm² sec — Criticality : 15 December 1961	— Owner : Italian Atomic Energy Commission (CNEN) — Operator or user : Ispra Centre — Constructor : Italian industry — Main suppliers : Italian industry	IT	T

SECTION XI A — Research, Training and Materials' Testing Reactors, etc.

REACTOR Site, description, use and address of managing body	CHARACTERISTICS	ENTERPRISES concerned	COUNTRY	STATUS
ISPRA ECO Experience Critique Orgel (general heavy water lattice study) Euratom Joint Research Centre, Ispra	— Type : Natural U, heavy - water - moderated, graphite reflector — Power : 1 kW(th) — Fuel : natural U — Load : 27 t (reference fuel) — Max. thermal neutron flux : — Criticality : scheduled for mid-1963	— Owner : JRC, Ispra — Operator : JRC, Ispra — Constructor : NV Neratoom (Netherlands) — Main suppliers : Reference fuel elements : NUKEM	EUR	C
ISPRA ESSOR (ESSai ORgel) Test Reactor (tests for heavy water, organic liquid string) Directorate-General for Research and Training, Euratom 51, rue Belliard Brussels	— Type : 2 zones : experimental zone with heavy water moderator, coolant and experimental fuel elements feeding zone : moderated and cooled with heavy water, 90 % enriched U — Power : 30 MW(th) — Fuel : experimental and 90 % enriched U — Load : about 7 kg U 235 — Max. thermal neutron flux : 10^{14} n /cm² sec — Criticality : scheduled for 1966	— Owner : Euratom — Operator or user : Euratom — Constructors : Groupement GAAA Interatom, Montecatini — Main suppliers : European industry	EUR	D
MILAN L 54 Experimental reactor Centro Studi Nucleari Enrico Fermi (CESNEF) Milan Polytechnical Institute, Milan	— Type : L 54, homogeneous uranyl sulphate solution — Power : 50 kW(th) — Fuel : 20 % enriched U — Load : 6.5 kg U — Max. thermal neutron flux : 10^{12} n /cm² sec — Criticality : 27 November 1959	— Owner : Milan Polytechnical Institute — Operator or user : Centro Enrico Fermi — Constructor(s) : — Main suppliers : North American Aviation Atomics International	IT	T
SALUGGIA (prov. Vercelli) Avogadro - RS 1 Experimental reactor Sorin 39, via Montebello Milan	— Type : swimming - pool, enriched U, heavy water moderated and cooled — Power : 1-5 MW(th) — Fuel : 20 % enriched U — Load : 25 kg U — Max. thermal neutron flux : 8×10^{12} n /cm² sec — Criticality : 9 September 1959	— Owner : SORIN — Operator or user : SORIN — Constructor(s) : — Main suppliers : American Machine and Foundry (AMF Atomics)	IT	T
SAN PIERO A GRADO (Leghorn - Pisa) Experimental reactor Camen Leghorn	— Type : swimming - pool, enriched U, light water moderated and cooled — Power : 1-5 MW(th) — Fuel : 20 % enriched U — Max. thermal neutron flux : 4×10^{3} n /cm² sec — Criticality : 1962	— Owner : Camen — Operator or user : Pisa University and Leghorn Naval Academy — Constructor(s) : Vitro International Company — Main suppliers : Babcock and Wilcox (USA)	IT	T

SECTION XI A — Research, Training and Materials' Testing Reactors, etc.

REACTOR Site, description, use and address of managing body	CHARACTERISTICS	ENTERPRISES concerned	COUNTRY	STATUS
PAVIA Subcritical assembly for research and training Laboratorio di Radiochimica Viale Taramelli, 12 Pavia	— Type : Heterogeneous subcritical assembly, natural U, light water moderated — Power : 0 — Fuel : natural U — Load : 2 t — Max. thermal neutron flux : 6×10^4 n /cm² sec — Criticality : 14 July 1958	— Owner : Società Incremento Technologia Energia Nucleare (SITEN) — Operator or user : Pavia University General Chemistry Institute — Constructor(s) : — Main suppliers :	IT	T
PAVIA Experimental reactor Pavia University Pavia	— Type : Triga Mark II, enriched U, light water moderated and cooled — Power : 250 kW(th) — Fuel : — Load : — Max. thermal neutron flux : 10^{13} n /cm² sec — Criticality : 1964	— Owner : Pavia University — Operator or user : Pavia University — Constructor(s) : — Main suppliers : General Dynamics Corporation (General Atomics) (USA)	IT	D
CASACCIA (25 km N of Rome) RC 1 Experimental reactor CNEN - Comitato Nazionale per l'Energia Nucleare 15, via Belisario Rome	— Type : Triga Mark II, enriched U, light water moderated and cooled — Power : 100 kW(th) — Fuel : 20 % enriched U — Load : 2.2 kg U 235 — Max. thermal neutron flux : 3×10^{12} n /cm² sec — Criticality : 10 June 1960	— Owner : CNEN — Operator or user : CNEN — Constructor(s) : — Main suppliers : General Dynamics Corporation (General Atomics) USA	IT	T
CASACCIA ROSPO (Reattore Organico sperimentale a Potenza O : Zero-Power Organic Experimental Reactor) Comitato Nazionale per l'Energia Nucleare 15, Via Belisario Rome	— Type : organic-moderated — Power : 0 — Fuel : 90 % enriched UO_2 — Load : 40 kg U 235 — Max. thermal neutron flux : — Criticality :	— Owner : CNEN — Operator or user : CNEN — Constructor(s) : — Main suppliers : Fuel : Martin Co, Baltimore	IT	C
PADUA Subcritical assembly Università degli studi di Padova Padova	— Type : natural U, light-water-moderated — Power : 0 — Fuel : natural U — Load : 1600 kg — Max. thermal neutron flux : 10^4 n /cm² sec — Criticality : none	— Owner : Padua University — Operator or user : Padua University — Constructor(s) : — Main suppliers :	IT	T

SECTION XI A — Research, Training and Materials' Testing Reactors, etc.

REACTOR Site, description, use and address of managing body	CHARACTERISTICS	ENTERPRISES concerned	COUNTRY	STATUS
PALERMO AGN 201 Experimental reactor Palermo University Via Maqueda, 175 Palermo	— Type : AGN 201 - enriched U, polyethylene moderated — Power : 0.1 to 5 Watts — Fuel : 20 % enriched U — Load : 3,3 kg U — Max. thermal neutron flux : 4.5×10^6 n /cm² sec — Criticality : 12 February 1960	— Owner : Palermo University — Operator or user : Istituto di Fisica Tecnica Palermo University — Constructor(s) : — Main suppliers : Aerojet General Nucleonics USA	IT	T
BRASIMONE (between Bologna and Florence) PRO Prototype reactor Centro di Studi Nucleari del Brasimone	— Type : OMR, cooled and moderated by Santowax-R or OMP — Power : 30 MW(th) — Fuel : UO_2 in stainless steel — Load : 41.24 kg U 235 — Max. thermal neutron flux : — Criticality :	— Owner : CNEN — Operator or user : CNEN — Constructor : CNEN Agip Nucleare and Sorin in consultation with Atomics International — Main suppliers :	IT	C
MONTECUCCOLINO (near Bologna) RB 1 Subcritical assembly Agip Nucleare Laboratori Nucleari della Università di Bologna	— Type : graphite - moderated subcritical assembly — Power : 0 — Fuel : — Load : — Max. thermal neutron flux : — Criticality : 30 July 1962	— Owner : — Operator or user : — Constructor(s) : — Main suppliers : Italian industry	IT	T
MONTECUCCOLINO (near Bologna) RB 2 Experimental reactor Agip Nucleare Laboratori Nucleari della Università di Bologna	— Type : Argonaut — Power : very low — Fuel : 20 % - enriched U — Load : — Max. thermal neutron flux : — Criticality :	— Owner : — Operator or user : — Constructor(s) : — Main suppliers :	IT	C
PETTEN LFR (Jason) Experimental reactor RCN - Reactor Centrum Nederland Scheveningseweg, 112 The Hague	— Type : Argonaut — Power : 10 kW(th) — Fuel : 90 % enriched U — Load : 4,725 kg U 235 — Max. thermal neutron flux : 1.5×10^{11} n /cm² sec — Criticality : 28 September 1960	— Owner : Reactor Centrum Nederland — Operator or user : Reactor Centrum Nederland — Constructor(s) : Dutch industry — Main suppliers : Hawker Siddeley (GB)	NL	T

SECTION XI A — Research, Training and Materials' Testing Reactors, etc.

REACTOR Site, description, use and address of managing body	CHARACTERISTICS	ENTERPRISES concerned	COUNTRY	STATUS
PETTEN HFR Testing reactor RCN - Reactor Centrum Nederland Scheveningseweg, 112 The Hague	— Type : High flux MTR enriched U, light water cooled and moderated — Power : 20 MW(th) — Fuel : 90 % enriched U — Load : 4.2 kg U 235 — Max. thermal neutron flux : 1.5×10^{14} n /cm² sec — Criticality : 9 November 1961	— Owner : Euratom as of 1 November 1962 — Operator and user : Euratom and RCN — Constructor(s) : Dutch industry — Main suppliers : Allis - Chalmers	NL	T
PETTEN KRITO Critical assembly N.V. tot Keuring van Elektrotechnische Materialen (KEMA) Utrechtseweg, 310 Arnhem	— Type : swimming-pool — Power : zero — Fuel : — Load : — Max. thermal neutron flux : — Criticality :	— Owner : KEMA — Operator or user : — Constructor(s) : — Main suppliers :	NL	T
DELFT HOR Experimental reactor Reactor Instituut Delft Nieuwlaan, 76 Delft	— Type : swimming-pool, enriched U, light water cooled and moderated — Power : 100 kW(th) — Fuel : 90 % enriched U — Load : 3.5 kg enriched U — Max. thermal neutron flux : 11×10^{12} n /cm² sec — Criticality : 1962	— Owner : Dutch Government — Operator or user : Joint University Institute, Reactor Instituut Delft — Constructor(s) : — Main suppliers : American Machine and Foundry (AMF Atomics)	NL	C
EINDHOVEN ATHENE Experimental reactor Technische Hogeschool (Technical University) Insulindelaan, 2 Eindhoven	— Type : Argonaut, light water cooled and moderated, graphite reflector — Power : 10 kW(th) — Fuel : enriched U — Load : 3.5 kg U 235 — Max. thermal neutron flux : $\neq 10^{11}$ n /cm² sec — Criticality : scheduled for end of 1964	— Owner : Technische Hogeschool Eindhoven — Operator or user : Technische Hogeschool Eindhoven — Constructor(s) : heat technology and reactor construction laboratory of the Technische Hogeschool Eindhoven — Main suppliers :	NL	D
ARNHEM Suspop - KSTR Reactor experiment N.V. tot Keuring van Elektrotechnische Materialen (KEMA) Utrechtseweg, 310 Arnhem	— Type : UO_2 and ThO_2 suspension in heavy water — Power : 250 kW(th) — Fuel : 90 % enriched U — Load : 2 kg U 235 — Max. thermal neutron flux : 10^{13} n /cm² sec — Criticality : scheduled for 1964	— Owner : Kema and Euratom (agreement of 1 July 1959) — Constructor(s) : — Main suppliers :	NL	C

SECTION XI A — Research, Training and Materials' Testing Reactors, etc.

REACTOR Site, description, use and address of managing body	CHARACTERISTICS	ENTERPRISES concerned	COUNTRY	STATUS
ARNHEM Suspension reactor Experimental reactor N.V. tot Keuring van Elektrotechnische Materialen (KEMA) Utrechseweg, 310 Arnhem	— Type : homogeneous suspension of 20 % enriched UO_2 in H_2O — Power : practically zero — Fuel : — Load : — Max. thermal neutron flux : — Criticality :	— Owner : KEMA — Operator or user : — Constructor(s) : — Main suppliers :	NL	T
WAGENINGEN BARN Experimental reactor Agricultural applications, food conservation, biological mutation Instituut voor de Toepassing van Atoomenergie in de Landbouw Wageningen	— Type : swimming-pool, enriched U — Power : 100 kW(th) — Fuel : 90 % enriched U — Load : 4 kg U 235 — Max. thermal neutron flux : 10^{12} n /cm² sec — Criticality : scheduled for spring of 1963	— Owner : ITAL (Institute for the use of Nuclear Energy in Agriculture) — Operator or user : Institute for the use of Nuclear Energy in Agriculture — Constructor(s) : Dutch industry — Main suppliers :	NL	C

REACTOR Site, description, use and address of managing body	CHARACTERISTICS	ENTERPRISES concerned	COUNTRY	STATUS
MOL BR3 Prototype reactor CEN - Centre d'Etudes Nucléaires 31, rue Belliard Brussels	— Type : PWR, enriched U, light water cooled and moderated — Power : 40 MW(th) - 10.5 MW(e) — Fuel : Two zones enriched U: 4.5 % and 3.7 %, in the form of UO_2 — Load : 2,006 kg (1,003 at 3,7 % 1,003 at 4,5 %) — Max. thermal neutron flux: 5,143 × 10^{13} n/cm² sec — Criticality : 30 August 1962	— Owner : CEN — Operator or user : CEN — Constructor(s) : Bureau d'Etudes Nucléaires, Belgonucléaires, Société de Traction et d'Electricité — Main suppliers : Westinghouse Electric Cº (USA)	BE	T
KAHL /Main Vak Prototype reactor Versuchsatomkraftwerk Kahl GmbH Kahl /Main	— Type : BWR, natural circulation, enriched U — Power : 60,4 MW(th) 15 MW(e) net with possibility of extension to 30 MW(e) — Fuel : UO_2 with average enrichment of 2.45 % — Load : about 6 t — Max. thermal neutron flux : 3,5× 10^{13} n/cm² sec — Criticality : 13 November 1960	— Owner : Versuchsatomkraftwerk Kahl GmbH — Operator or user : Versuchsatomkraftwerk Kahl GmbH — Constructor(s) : International General Electric and AEG — Main suppliers : Civil Engineering : Hochtief AG., Essen Heat exchangers : Gutehoffnungshütte Sterkrade AG. Containment shell and airlocks : MAN Water decontamination : Pintsch Bamag	GF	T
JÜLICH Prototype reactor Arbeitsgemeinschaft Versuchsreaktor GmbH Düsseldorf	— Type : quasi-homogeneous, high temperature reactor, graphite-moderated, cooled by air, Ne and He — Power : 49 MW(th) - 15 MW(e) — Fuel : 20 % enriched U and Th — Load : 23.5 kg enriched U and 340 kg Th — Max. thermal neutron flux : — Criticality : scheduled for 1963	— Owner : Arbeitsgemeinschaft Versuchsreaktor GmbH (AVR) Düsseldorf — Operator or user : AVR — Constructor(s) : BBC and Krupp — Main suppliers : BBC and Krupp — Fuel elements : NUKEM	GF	

SECTION XI B — Power Reactors and Prototype Reactors

REACTOR Site, description, use and address of managing body	CHARACTERISTICS	ENTERPRISES concerned	COUNTRY	STATUS
KARLSRUHE Multi-purpose research reactor (MZFR) Gesellschaft für Kernforschung m.b.H. (K II) Friedrichsplatz, 4 Karlsruhe	— Type : natural U, heavy water cooled and moderated — Power : 200 MW(th) - 50 MW(e) net — Fuel : UO_2 — Load : 13,500 kg — Max. thermal neutron flux : 10^{14} n/cm² sec — Criticality : probably 1965	— Owner : Gesellschaft für Kernforschung, m.b.H. Karlsruhe and Lichtwerke AG — Operator or user : Kernforschungszentrum Karlsruhe — Constructor(s) : SSW Erlangen — Main suppliers : Pressure vessel : Klöckner Werke AG	GF	C
STUTTGART (Obrigheim/Mosbach) K.B.W.P. Industrial reactor Kernkraftwerk Baden- Württemberg Planungsgesellschaft m.b.H. Goethestrasse, 12 Stuttgart-N	— Type : OMR — Power : 475 MW(th) - 150 MW(e) — Fuel : 2.6 % enriched U or UMo alloy — Load : 38.6 kg — Max. thermal neutron flux — Criticality : about 1967	— Owner : KBWP — Operator or user : Company yet to be constituted — Constructor(s) : North American Aviation (Atomics International) Interatom, Brown Boveri & C°. — Main suppliers :	GF	P
GUNDREMMINGEN (Kreis Günzburg) KRB Industrial reactor Kernkraftwerk-RWE-Bayernwerk (KRB) Gundremmingen Kreis Günzburg	— Type : BWR — Power : 801 MW(th) - 237 MW(e) net — Fuel : U with an average enrichment of 2.6 % — Load : 57.8 t UO_2 — Max, thermal neutron flux : ~ 3×10^{13} n/cm² sec — Criticality : end of 1965	— Owner : Kernkraftwerk RWE-Bayernwerk G.m.b.H. (KRB) — Operator or user : Kernkraftwerk RWE-Bayernwerk G.m.b.H. (KRB) — Constructor(s) : IGEOSA in cooperation with AEG, Hochtief AG — Main suppliers : Containment : Dinglerwerke Saarbrücken	GF	C
MARCOULE G. 1 Industrial reactor Centre de production de plutonium de Marcoule Chusclan (Gard)	— Type : natural U, graphite-moderated, air-cooled — Power : 43 MW(th)-5MW (e) — Fuel : Naturel U — Load : 95 to 105 t — Max. thermal neutron flux : 5×10^{12} n/cm² sec — Criticality : 7 January 1956	— Owner : Reactor : CEA Connected power plant : EDF — Operator or user : Plutonium : CEA Electricity : EDF — Constructor(s) : Industrial architect : SFAC — Main suppliers : French industry	FR	T

REACTOR Site, description, use and address of managing body	CHARACTERISTICS	ENTERPRISES concerned	COUNTRY	STATUS
MARCOULE G 2 Industrial reactor Centre de Production de Plutonium de Marcoule Chusclan (Gard)	— Type : natural U, graphite gas — Power : 240 MW(th) - 37 MW(e) — Fuel : natural U — Load : 105 t — Max. thermal neutron flux : 2.5×10^{13} n/cm² sec — Criticality : 21 June 1958	— Owner : Reactor : CEA Connected power plant : EDF — Operator or user : Plutonium : CEA Electricity : EDF — Constructor(s) : CEA and EDF Industrial architect : SACM (Alsacienne) — Main suppliers : French industry	FR	T
MARCOULE G. 3 Industrial reactor Centre de Production de Plutonium de Marcoule Chusclan (Gard)	— Type : natural U, graphite gas — Power : 240 MW(th) - 37 MW(e) — Fuel : natural U — Load : 105 t — Max. thermal neutron flux : 2.5×10^{13} n/cm² sec — Criticality : 11 June 1959	— Owner : Reactor : CEA Connected power plant : EDF — Operator or user : Plutonium : CEA Electricity : EDF — Constructor(s) : CEA and EDF Industrial architect : SACM (Alsacienne) — Main suppliers : French industry	FR	T
CHINON EDF 1 Industrial reactor Electricité de France 68, Faubourg St Honoré Paris 8e	— Type : Natural U, graphite-moderated, CO_2 cooled — Power : 300 MW(th) - 700 MW(e) — Fuel : natural U — Load : 140 t — Max. thermal neutron flux : 4.5×10^{13} n/cm² sec — Criticality : 16 September 1962	— Owner : EDF — Operator or user : EDF — Constructor(s) : EDF Région d'Equipement Thermique Nucléaire nº 1 Clamart — Main suppliers : Pressure vessels : Ets Levivier Heat exchangers : Babcock-Wilcox Cie des Echangeurs Chantier de l'Atlantique Fives-Lille-Cail CO_2 circuits and condensers : SFAC Turbo-blowers : SNECMA	FR	T

REACTOR Site, description, use and address of managing body	CHARACTERISTICS	ENTERPRISES concerned	COUNTRY	STATUS
CHINON EDF 2 Industrial reactor Electricité de France 68, Faubourg St Honoré Paris 8e	— Type : Natural U, graphite moderated CO_2 - cooled — Power : 791 MW(th) - 170/200 MW(e) — Fuel : Natural U — Load : 250 t — Max. thermal neutron flux : 3×10^{13} n/cm² sec — Criticality : scheduled for beginning of 1963	— Owner : EDF — Operator or user : EDF — Constructor(s) : EDF, Retn 1 — Main suppliers : French industry	FR	C
CHINON EDF 3 Industrial reactor Electricité de France 68, Faubourg St-Honoré Paris 8e	— Type : Natural U, graphite moderated CO_2 - cooled — Power : 1250 MW(th) - 375-500 MW(e) — Fuel : Natural U — Load : 409 t — Max. thermal neutron flux : — Criticality : scheduled for 1965	— Owner : EDF — Operator or user : EDF Constructor(s) EDF, Retn 1 — Main suppliers : French industry	FR	C
ST LAURENT-DES-EAUX (Loir-et-Cher) EDF 4 Industrial reactor Electricité de France 68, Faubourg St-Honoré Paris 8e	— Type : natural U, graphite-moderated, CO_2 - cooled — Power : 400-500 MW(e) — Fuel : natural U — Load : — Max. thermal neutron flux : — Criticality : about 1967, construction work beginning in 1963	— Owner : EDF — Operator or user : EDF — Constructor(s) : — Main suppliers :	FR	D
CHOOZ (near Givet, Meuse) Centrale Nucléaire des Ardennes Industrial reactor Société d'Energie Nucléaire Franco-Belge des Ardennes (SENA) c/o EDF 68, Faubourg St-Honoré Paris 8e	— Type : PWR — Power : about 210 MW(e) with possibility of extension to 242 MW(e) — Fuel : 3.5 % enriched U — Load : 44.5 t UO_2 — Max. thermal neutron flux : 2.5×10^{13} n/cm² sec — Criticality : scheduled for 1965	— Owner : Société d'Energie Nucléaire Franco-Belge des Ardennes (SENA) — Operator or user : EDF and SA Centre et Sud — Constructor(s) ACEC — Framatone — Westinghouse Group (US) — Main suppliers : Reactor : SFAC Turbine : SFAC Heat exchanger : Cockerill-Ougrée Alternator : ACEC and SW Fuel : Westinghouse, MMW and CERCA	FR and BE	C

REACTOR Site, description, use and address of managing body	CHARACTERISTICS	ENTERPRISES concerned	COUNTRY	STATUS
BRENNILIS (Finistère) E.L. 4 Centrale Nucléaire des Monts d'Arrée Prototype reactor Commissariat à l'Energie Atomique 69, rue de Varenne Paris 7e	— Type : natural U, heavy water moderated (80 t), CO_2 - cooled — Power : 225 MW(th) - 80 MW(e) — Fuel : beryllium-clad UO_2 — Load : 18 t — Max. thermal neutron flux : 1.6×10^{14} n/cm² sec — Criticality : scheduled for 1964	— Owner : CEA/EDF — Operator or user : CEA/EDF — Constructor(s) Responsible contractor CEA Electromechanical section: EDF Industrial architect : Indatom — Main suppliers :	FR	C
TRINO VERCELLESE (between Milan and Turin) Nuclear Power Plant Enrico Fermi Industrial Reactor Società Elettronucleare Italiana s.p.a. Fora Buonaparto, 31 Milan	— Type : PWR, enriched U, light water moderated and cooled — Power : 615 MW(th) - 165 MW(e) — Fuel : 2.6 - 2.8 % enriched U — Load : 39 t U Max. Thermal neutron flux: — Criticality : scheduled for 1964	— Owner : SELNI — Operator or user : SELNI — Constructor(s) : Westinghouse Electric Co (USA) — Main suppliers : Reactor Westinghouse (US) Turbines : Franco Tosi Generators : Marelli	IT	C
GARIGLIANO Centrale Elettronucleare Del Garigliano Industrial reactor Società Elettronucleare Nazionale (SENN) Via Torino, 6 Rome	— Type : BWR, enriched U, light water moderated and cooled — Power : 508 MW(th) - 150-230 MW(e) — Fuel : 2 % enriched U — Load : 41.4 t U — Max. thermal neutron flux : — Criticality : scheduled for 1963	— Owner : SENN — Operator or user : SENN — Constructor(s) : International General Electric Operations SA (Geneva) — Main suppliers : Heat Exchanger : Stork en Co (Holland) Pressure vessels : Terni Shell : SIA (Genoa) Turboalternator : Ansaldo (Genoa)	IT	C
LATINA (Foce Verde) Industrial reactor Società Italiana Meridionale Energia Atomica (SIMEA) Via San Teresa, 35 Rome	— Type : GCR, natural U, graphite moderated, CO_2 cooled — Power : 705 MW(th) - 200 MW(e) — Fuel : natural U — Load : 262.5 t — Max. thermal neutron flux : — Criticality : 27 December 1962	— Owner : SIMEA — Operator or user : SIMEA — Constructor(s) Nuclear Power Plant and Co (NPPC) — (GB) — Main suppliers :	IT	T

SECTION XI B — Power Reactors and Prototype Reactors

REACTOR Site, description, use and address of managing body	CHARACTERISTICS	ENTERPRISES concerned	COUNTRY	STATUS
SITE NOT YET DETERMINED Joint Dutch Nuclear Power Plant Prototype reactor N.V. Gemeenschappelijke Kernenergiecentrale Nederland (GKN)	— Type : BWR — Power : 163.4 MW(th) - 50 MW(e) — Fuel : UO_2 with 2.5 % (1st core) to 1.36 % (2nd core) enrichment — Load : — Max. thermal neutron flux : — Criticality : scheduled for end of 1967 (construction work starting end 1963)	— Owner : NV-GKN — Operator or user : NV-GKN — Constructor(s) : Dutch industry (General Electric Licence) — Main suppliers : Dutch industry	NL	P

SECTION XI C — Marine Propulsion Reactors (Preliminary Designs)

REACTORS	BODIES concerned	REMARKS	STATUS
BELGIUM			
PWR Spectral shift type (Variable quantity of heavy water moderator)	Financed by : — Syndicate „Vulcain" (group of private companies : Belgonucléaire, Cockerill-Ougrée, Cie Maritime Belge, etc.) — Etat-Belge — CEN — UKAEA	On 16 May 1962 an agreement was concluded between the UKAEA and the „Vulcain" syndicate on the financing of research and development work connected with the project	P
GERMANY			
OMR Reactor producing 10,000 shaft horsepower	Gesellschaft für Kernenergieverwertung in Schiffbau and Schifffahrt m.b.H. Hamburg (GKSS) and Interatom G.m.b.H. Bensburg (DEMAG) and Atomics International	Euratom is making a 40 % contribution to the cost of the experiments and is also participating in the constructional design work on the basis of which, together with the experience gained from the Piqua reactor (USA), the decision to build the reactor will be taken	P
PWR Reactor producing 20,000 shaft horsepower	SIEMENS-SCHUCKERTWERKE A.G, Erlangen, and HOWALDT-WERKE A.G, Hamburg.	Subsidy of 1.5 million DM granted by the Federal Government. Total cost of the studies : 3 million DM	P
BWR Reactor producing 20,000 shaft horsepower	Allgemeine Elektricitäts-Gesellschaft (AEG) Frankfurt and Deutsche Werft, Hamburg	Subsidy of 1.5 million DM to be provided by the Federal Government Total costs of studies : 3 million DM	P
HTR High-temperature gas-cooled reactor, direct cycle, for a power of 20,000 shp.	BBC - KRUPP Reaktorbau G.m.b.H., Düsseldorf and AG WESER, Bremen	Subsidy of 1 million DM granted by Federal Government	P
FRANCE			
Land - based advanced gas-cooled reactor with a power of 25 MW(th)	Commissariat à l'Energie Atomique and Secrétariat d'Etat à la Marine Marchande		P

SECTION XI C — Marine Propulsion Reactors (Preliminary Designs)

REACTORS	BODIES concerned	REMARKS	STATUS
ITALY			
Studies on : PWR forced circulation PWR natural circulation BWR direct cycle BWR indirect cycle	FIAT Company and ANSALDO in conjunction with EURATOM	Reactor and ship studies Selection of reactor type in Phase I of contract, followed by drafting of Title I design in phase II. Euratom contributes 40 %	P
NETHERLANDS			
PWR 60 MW(th) pressurized water reactor	Reactor Centrum Nederland, and EURATOM	Contract signed by Euratom and the Reactor Centrum Nederland on 1 December 1961 Programme scheduled : — draft design — research and development programme leading to a decision on the construction of a prototype reactor. Euratom contributes 40 %	P

SITE of installation and address of managing body	CHARACTERISTICS	ENTERPRISES concerned	COUNTRY	STATUS
MARCOULE Commissariat à l'Energie Atomique 69, rue de Varenne Paris 7e		Owner and operator : CEA	FR	T
FONTENAY-AUX-ROSES Commissariat à l'Energie Atomique 69, rue de Varenne Paris 7e	Continuous evaporation process Two 1 t /hr evaporators	Owner and operator : CEA	FR	P
MOL Société Belge de Chimie Nucléaire S.A. (Belchim) 35, rue des Colonies Bruxelles		Owner : Centre d'Etudes Nucléaires Operator : Belchim	BE	T

ANNEX

International Installations with which Euratom or the Member Countries are Associated

SITE of installation and address of managing body	CHARACTERISTICS	ENTERPRISES concerned	COUNTRY	STATUS
WINFRITH HEATH (Great Britain) DRAGON Reactor experiment	— Type : high - temperature, gas-cooled graphite moderated reactor — Power : 20 MW(th) — Fuel : 90 % enriched U and Th — Load : 20 kg U 235 — Termination of construction work scheduled for spring 1963	— Owner : UKAEA on termination of the agreement for cooperation concluded under the auspices of the Nuclear Energy Agency of the OCDE — Participants : Britain, Austria, Denmark, Norway, Switzerland, Sweden, and Euratom — Operator : Dragon project group — Constructor(s) : UKAEA industrial group British and Continental firms	UK	C
HALDEN (Norway) Power plant prototype supplying steam to paper and pulp-producing firm Institut før Atomenergi Kjeller (Norway)	— Boiling heavy water reactor — Power : 20 MW(th) — 1st core criticality : 29 June 1959 — Bringing into operation : 10 October 1959 — 2nd core criticality : April 1962	— Owner : Institut før Atomenergi, Kjeller — Operators : 5 member countries of OCDE and EURATOM Associated countries : USA and Finland — Constructors : Design : Institut før Atomenergi, Kjeller Civil Engineering : Høyer Ellesfen — Suppliers : Mechanical installations : Kvaerner - Myrhen, Thune Combine Operating and control instrumentation : Ch. Michelsens Institut Fuels : UKAEA Heavy water : USAEC	NORWAY	T
MOL (Belgium) EUROCHEMIC Plant for chemical reprocessing of irradiated fuels „Société européenne pour le Traitement chimiques de Combustibles irradiés" (EUROCHEMIC) 35, rue Belliard Brussels	— Plant for reprocessing of natural uranium based on 5 % enriched irradiated fuels — Capacity : 38 to 50 t /year — Cold tests scheduled for beginning of 1963 — Hot tests scheduled for end of 1963	— Owner and operator : EUROCHEMIC, company instituted under international public law by 12 governments : Germany, Austria, Belgium, Denmark, France, Italy, Norway, Netherlands, Portugal, Sweden, Switzerland, Turkey and subsequently Spain — Constructor : a group of enterprises headed by Saint Gobain (France), with : Nohab (Sweden), Belchim (Belgium), Montecatini (Italy), Argtu (Germany), Comprimo (Netherlands), Noratom (Norway)	BE	C

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